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NEWS AND TRENDS . . .
IN CITY DEVELOPMENT

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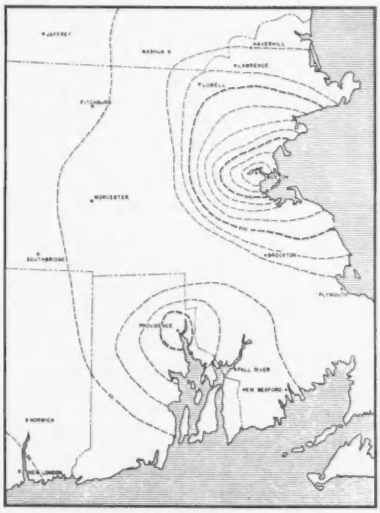
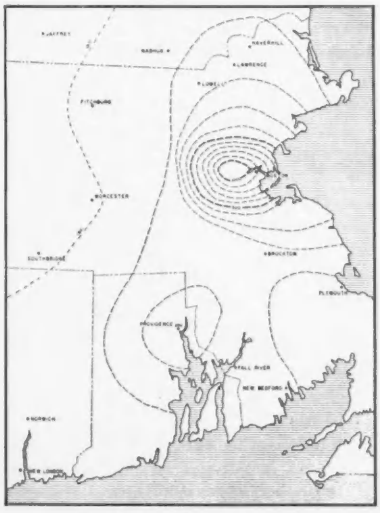
THE REGIONAL IMPACT OF HIGHWAYS

The J. C. Nichols Foundation Research Study 1958-1959

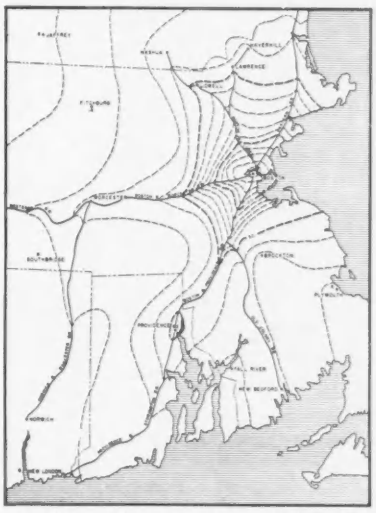
by
Philip B. Herr
Massachusetts Institute of Technology



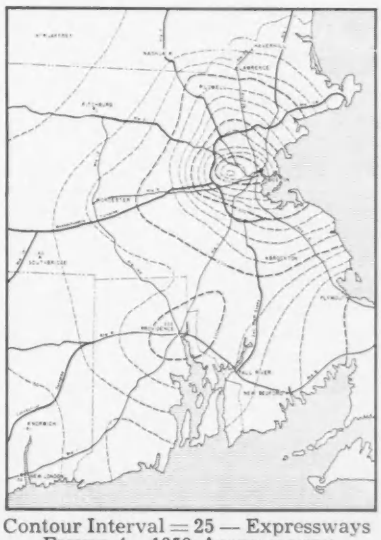
Contour Interval = 50
FIGURE 1. 1840 POTENTIAL



Contour Interval = 100
FIGURE 2. 1950 POTENTIAL



Contour Interval = 10 — Railroads
FIGURE 3. 1840 ACCESSIBILITY



Contour Interval = 25 — Expressways
FIGURE 4. 1959 ACCESSIBILITY

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Plan-itorial . . .

What's New in Land Planning?

During the 'fifties, the flow of home building blindly followed the pattern of the single-family house standing on its own lot. This stereotyping of development leads to questions about continuing the pattern without limit. With rising costs both for the raw land and for the lot improvements, the price of housing for our growing America is getting out of hand. Besides this, the extent to which our open land is being gobbled up is dismaying.

Concern about the economics and efficiency of our land development pattern points to the need for new thinking in anticipation of our housing growth in the years ahead. Fortunately, a study of creative concepts in subdivision design and land development for residential use is now underway.

Research on Land Planning Innovations

Recently, the National Association of Home Builders and the Urban Land Institute agreed to a joint sponsorship of the highly needed research study. Innovations in residential subdivision and community development will be investigated to find practical suggestions for methods which will improve those in current practice. The study is being administered by ULI under a grant of funds by NAHB, supplemented by the Institute, and is the result of several months exploration by NAHB's Land Use Committee. Under this arrangement, the firm of Harman, O'Donnell and Henninger Associates of Denver has been retained as consultants in developing the study.

Concepts to be Included

The study will involve the general review of land planning concepts and innovations having applicability to the residential use of land, and a general evaluation of a selected number of existing projects where one or more innovations have been developed and are in use. The review is designed to catalogue concepts already developed over several decades and to give background for evaluating new concepts and pointing up directions of further worthwhile and productive investigation.

For example, we need to explore concepts that provide for variations from the orthodox method of land planning such as (1) contour or topographic planning with its recognition of natural land forms; (2) the "superblock" with its claims of economy and increased amenity; (3) the "garden" apartment with its combination of superblock and topographic advantages in the siting of multi-family dwellings; (4) the geometric principle with its utilization of aerial-lineal proportion; (5) the double and triple building line with its multiple use of street frontage.

At this point, major attention will also be directed toward present and emerging forms of urban living, without reference to arbitrary public controls but with due consideration for economic and social habits and practices. Practical limitations of physical factors modified by developments in technological methods will be given serious consideration.

Cooperation Desired

In addition to NAHB, the Housing and Home Finance Agency is actively cooperating in the study as are other organizations such as the American Institute of Architects, American Institute of Planners, American Municipal Association, American Society of Civil Engineers, American Society of Landscape Architects, American Society of Planning Officials, National Association of County Officials, National Association of Real Estate Boards, and the United States Chamber of Commerce.

As a member of Urban Land Institute, your active assistance and participation in the study is highly important in order that no new avenues of approach

(Continued on Page 8)

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THE J. C. NICHOLS AWARDS

In the academic year 1958-1959, Philip B. Herr became the fifth holder of the J. C. Nichols Foundation Award. This grant-in-aid is offered each year to a graduate student in the field of urban planning to stimulate research on problems of urban growth and development, under the auspices of the J. C. Nichols Foundation of Urban Land Institute and a faculty committee from the university selected as sponsor. For those ULI members and others who have contributed money to the J. C. Nichols Foundation the following summary of the studies to date is offered.

Before 1954 the Award was a prize for the best essay submitted at the sponsoring university on the general topic of "Improvement of Community Life in the United States." Under this form two prize winning essays were published in *Urban Land*: "Disaster

(Continued on Page 8)

NEW OFFICERS AND TRUSTEES OF ULI

Boyd T. Barnard of Philadelphia was elected eleventh president of Urban Land Institute at the annual meeting of its Board of Trustees held on January 24, in Washington, D. C. He succeeds David D. Bohannon of San Mateo, California.

Mr. Barnard served as first vice president of the Institute in 1958 and 1959 and has been chairman of the Institute's Central Business District Council since 1950. He is one of the nation's most experienced appraisers and is president of Jackson-Cross Company, Realtors, of Philadelphia. This firm represents many large financial and commercial clients in the management of real estate. Mr. Barnard is a former president of both the National Association of Real Estate Boards and the American Institute of Real Estate Appraisers. He is a graduate of Swarthmore College and has served as a member of the school's Board of Managers, as well as chairman of its Executive Committee. He is a director of Tradesman's Bank and Trust Company of Philadelphia and the Philadelphia Chamber of Commerce.

BOYD T. BARNARD
President, Urban Land Institute

Other 1960 officers elected were: first vice president, Clarence M. Turley of St. Louis; second vice president, Maurice G. Read of Berkeley, California; secretary, Waverly Taylor of Washington, D. C.; and treasurer, U. A. Denker of Wichita.

New members of the Board of Trustees elected by the ULI membership are James B. Douglas, president of The Northgate Company, Seattle; Walter Patchell, vice president, Pennsylvania Railroad Company, Philadelphia; and Angus G. Wynne, Jr., president of the Great Southwest Corp., Dallas. Board members elected by the Trustees are Irving G. Bjork, vice president, Connecticut General Life Insurance Company, Hartford; and Carl R. Dortch, assistant general manager, Indianapolis Chamber of Commerce.

Re-elected to the Board were: Robert C. Hienton, Cleveland; Earl D. Hollinshead, Pittsburgh; Paul L. McCord, Indianapolis; H. A. Moore, Chicago; Larry Smith, Seattle; Waverly Taylor, Washington, D. C.; Roswell F. Thoma, Buffalo; Foster Winter, Detroit; and J. W. York, Raleigh, North Carolina.

THE REGIONAL IMPACT OF HIGHWAYS

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Editor's Note

Results from the J. C. Nichols Foundation Award program are often more measurable in terms of the development of scholarship and potentials for future attainment than in the significance of the initial research paper. A further contribution is in attracting mature students to the study of urban problems and in making it possible for them to receive training in research. This study by Philip B. Herr should be judged first from the standpoint of whether it is a useful step in the training of a promising student and, second, whether some of the results are helpful to others. From both viewpoints the document here published in condensed form is worth while.

Mr. Herr's study makes a contribution in reducing to pictorial form the impacts of railroad development of a century ago. Such impacts have been described in words, but never previously in graphic form. By way of constructive suggestion, the addition of tables and formulae showing how he developed the graphs, so that others could check, duplicate or modify his methods and results, would have made this part of the study more valuable. Documentation is an essential ingredient in research procedure.

The study seems to approach its subject in terms of a static, rather than dynamic, economy. For instance, Mr. Herr's suggestion that an additional road would not make much difference to a given community suggests that the element of highway capacity was not considered. An additional road might give a community the highway capacity needed to attract industry, trade or population in competition with another community not having such highway capacity. If there were no additional industry, trade or population to attract, the statement might be true. It is not likely to be true in a dynamic situation.

Introduction

The construction of the Interstate Highway System is probably the most ambitious transportation improvement program in the history of this country; possibly in the history of the world. The land use impact of this system has to some extent been made a consideration in its design. We now have enough experience with highway improvements within metropolitan areas to understand the ability of highways to eradicate slums, channel growth into new areas, revive declining areas, and to curtail growth in sections poorly served.

Our understanding of highway effects on a larger scale is less complete. Does

making Scranton a major junction of interstate routes give it an advantage over Wilkes-Barre, which is not? Is Evansville significantly hurt in comparison with better served cities in the area because it is not connected with the interstate system?

Can the general alignment of intermetropolitan highways be used as an effective tool for implementing our national policy of aid to depressed areas? For instance, could a highway system designed to benefit Providence, Fall River and New Bedford, significantly help their economic health?

If it were determined that metropolitan areas with a population of about two million are socially and economically "inefficient," could their growth be retarded and development channeled into smaller cities through decisions on highway alignment? Or, conversely, could the growth of small metropolitan areas be encouraged by highway location?

These are some of the aspects of the importance of highway location to economic and demographic trends at the intermetropolitan or regional scale. Whether or not highway location can affect migration rates depends largely upon its ability to influence regional economics. A positive relationship between economic health and migration has been well substantiated statistically. Net migration shows a strong correlation with differences in median income; people move out of low income (or depressed) areas and into high income (or healthy) areas, not only interregionally but also within each region. If highway location can significantly affect economic health, can it also affect migration rates?

The effects of highway location upon the economic health or advantage of one area compared with others depends upon such factors as: The magnitude and pattern of transportation service changes and differentials between points which can be produced by highway location; the importance of these changes and differentials as a part of living and production costs; and the extent to which these differences in transport costs (measured in both money and time) affect locational decisions of persons and firms.

The purpose of this study is to analyze, describe, and measure the pattern of transportation costs, in addition to studying the effect of highway location on these costs. For comparison with highway cost differentials and resultant land use effects, a study is made of the impact of the railway network of the 1830's to 1850's. From such a comparison of transport cost differentials and resultant effects the *probable* impact of the current intercity highways program and the value of highway location as a regional planning tool can be assessed. The area studied in detail is southeastern New England, chosen because of availability of material and a transportation history well suited to this type of study.

Method of Study

The method used for describing the pattern of transportation costs and cost differentials is that of "gravity model" analysis. "Gravity" or "potential" models can be considered as essentially probability models of the desirability (from a transportation cost standpoint) of different locations for the "typical" or "average" firm or individual.

A person or firm will normally want to ship or travel from his location to other cities in direct proportion to their sizes and in inverse proportion to their distances away. While not strictly true in all cases, this general effect has been well established by numerous tests involving freight statistics, airplane trips, and traffic surveys, as well as by simple logic. The probability of a person having a business contact in a neighboring city and so a desire for travel will, all other things being equal, depend upon how large that city is, and how far away it is. For freight shipments, the same sort of logic applies, with the additional distance effect that since some goods are nearly ubiquitous (sand need not be imported to Boston from California) and hence few are unique; that only unique goods need be imported without regard to distance.

The "cost" of carrying out personal and goods interactions is dependent upon how far the locations in question are separated. Therefore, from the standpoint of transportation costs, locational advantage consists of having large amounts of population a short distance away. The locational advantage or "potential" of a location is the sum of the "potential" contributions of each surrounding point. Also, the contribution of each point is proportional to its size, and inversely proportional to a function of its distance away. By making a computation for a number of locations, a "contour map" of lines of equal potential, or transport advantage, can be plotted.

Models

Figure 1 is a "contour map" of potential for southeastern New England in 1840. Figure 2 is a similar map for 1950. These indicate the pattern of transportation advantage which would obtain if all the northeastern United States were flat and paved, and everyone moved freely in a personal vehicle. Although the magnitudes involved are different, the two maps have strikingly similar patterns, indicating similar population distribution in the two eras.

These models consider only the population of the Northeast—north and east from New York City and south from Portland, Maine. To consider more or less of the nation's population would make some difference in the values obtained, but the pattern would have most of the same characteristics. A potential model considering the population of the entire nation would represent the advantage pattern only for that minority of persons and firms which operate nationally, and would be relatively insensitive to "local" changes in transportation in the Northeast. A model covering less than the area from New York to Portland would fail to include a large part of the intercity trucking and nineteenth century rail business carried on by persons and firms within the model area.

To measure the effects of the transportation system, some of the unrealistic assumptions of these models are dropped. Rather than unchanneled transportation, the actual configuration of transport lines is used. Rather than costs exactly and uniformly proportional to distance, rates varying with mode, distance, and quality of facility are used, measuring both dollar cost and elapsed time, which is given an imputed fiscal value. Instead of two models, one for goods and one for people, one model "weighted" for both has been made. Whereas for 1840, railroad and highway transportation were considered, for 1959 only highway transportation was considered.

Except for these changes, models are computed exactly as before. Figures 3 and 4 show the results for 1840 and 1959. These are called "accessibility" models to distinguish them from the "potential" models which assumed straight-line distances and costs. The terms "potential" and "accessibility" have frequently been used interchangeably. In this study, "potential" refers to the set of values obtained using spatial separation as the "distance" dimension; "accessibility" refers to the set of values obtained using time and cost separation over the actual system configuration. Potential and accessibility models do not have directly com-

parable magnitudes, but their *patterns* can meaningfully be compared. Also, magnitudes of accessibility cannot be directly compared between eras, although their range and patterns might be.

Findings

Differences between the potential and accessibility patterns are of great significance. The impact of a transportation system on locational advantage could be defined as the differences between the pattern of advantage which would result from an unchanneled system equally efficient in all directions, with straight-line time and cost variations, and the pattern of advantage which actually does result under the realistic conditions. In the terms used here, the impact of a transportation system on locational advantage is indicated by the differences between the patterns of potential and of accessibility.

The first finding made from these diagrams is that the distortions in the pattern of advantage produced by the transportation systems of the 1840's were far greater than the distortions produced today. The "valleys" of relatively low accessibility between rail lines are quite deep in 1840; "valleys" hardly appear in 1959 at all. Location on a rail line or a short distance away from it made a great deal of difference in accessibility in 1845. Location on an expressway or a short distance away from it makes relatively little difference today.

A second finding made from a study of these models is that the range of accessibility values is much narrower today than in 1840. In 1840 accessibility values range from 8 (Jaffrey, N. H.) to 145 (Boston), the largest being 18 times the magnitude of the smallest. In 1959 the range is from 67 (Jaffrey) to 458 (Boston), the largest being less than seven times the smallest. Thus intercity differences in transportation advantage now have a narrower range than formerly.

A third finding, which is almost a corollary of the second, is that the pattern changes produced by changes in the transportation network are likely in general to be less dramatic today than they were in the 1840's.

The reasons for the relatively small change in accessibility produced by new expressways are, first, that the savings in time and cost via expressways as compared with the roads that they replace are far smaller than the savings in 1840 by railroad as against wagon. Second, the web of transport channels is far "finer" today than in 1840, with fairly good roads going virtually everywhere with a minor degree of circuity. As it develops further and further, our transportation network approaches the assumptions of uniform service made in computing "potential" as the accessibility pattern more closely approximates the potential pattern, the feasibility of using channel configuration as a planning tool is diminished.

Another finding is that, given ideal conditions, a new highway can raise the *magnitude* of accessibility of an area by about the same proportion as the new rail lines did in 1849, but that generally magnitude changes will be relatively small. New London typifies the type of location where new highway construction can make great changes in accessibility. It was poorly served with highways initially. It is in an area of low potential, with that potential being virtually all "contributed" by two cities—New York and Providence. This means that a single highway improving the links to those two cities is of greater relative importance than any single highway can be for, say, Worcester, which draws significant potential from a number of different directions, as well as from itself.

Great changes in accessibility can be expected only when a new highway replaces a very poor one, when it leads out of a major population center (or centers), and serves an area of low potential dominated by the importance of the connected population center (or centers)—which excludes the possibility of massive change in accessibility of a major metropolitan area. Unlike the more "channeled" impact of the railroad, this will affect a broader area than the immediately contiguous towns and cities.

Summarizing the findings made from these models, differences in locational advantage fall within a narrower range today than in 1840. Exact location with respect to the transportation network made greater differences in accessibility in 1840 than it does today, due to the "channelized" effect of railroad impact. Changes in the highway network today are less likely to make startling changes in the pattern of accessibility than did changes in the 1840's, but new construction may still produce great alteration in accessibility under special conditions.

Empiric Evidence

Empiric evidence of the significance of differences and changes in accessibility can be found by following population changes, since these are well recorded back to 1790, and are indicators not only of population movement but also of the economic health of the areas.

Two hypotheses have been investigated. The first is the relatively simple idea that, since areas of highest accessibility have a transportation cost and hence economic advantage over areas of low accessibility, they should grow fastest; accessibility and net migration rates should be positively correlated.

This hypothesis was not upheld by correlation study for either the 1840's or the 1950's, and common-sense examination of growth patterns in the area tends to verify that this lack of correlation was not a failure of methodology but that *at least at this scale* accessibility and population growth are not strongly correlated.

The second hypothesis is that rate of growth is related to change in accessibility; that is, an area recently having had a great increase in accessibility will grow faster (other things being equal) than other areas in close proximity which did not have such an increase. This was convincingly verified by data from the nineteenth century and, although it was impossible to test this hypothesis for the 1950's, it can be inferred from contemporary data that it holds equally true today that change in accessibility and population growth are positively correlated.

The relationship between accessibility and population change can be explained in terms of the dynamic equilibrium which exists within regions. Accessibility, along with labor costs and availability, tax and utility costs, special features of some sites (water power, "prestige" location), and land costs and availability constitute an attractive set of forces "balanced" by migration rates. Sudden alteration of any one of these forces or components will cause a change in the resultant level of migration until "equilibrium" is again reached, in much the same way that unbalanced physical forces cause acceleration. The basic equilibrating forces are land costs and land availability, the first rising and the second declining, following increase in accessibility, until a density appropriate to the new level of accessibility and the other site features (taxes, utility costs, etc.) is reached. If land costs were immediately and fully responsive to change in relative accessibility (or to change in the other factors), differential growth rates would exist only to the extent that the high density uses normally

prefer locations of high accessibility. The significance of change in accessibility lies largely in this lagging of land cost behind the use value of land following change.

This relationship between change in accessibility and population growth is a relatively short-term one (perhaps ten to twenty years) which modifies long-range trends of migration to the West and into urban areas, so that "equilibrium" in most cases is not zero growth but growth at some rate determined by secular trends. A long-range relationship between accessibility and population growth may exist at this scale, obscured in relatively short-range studies by the more dramatic population changes associated with change in accessibility.

The hypothetical relationship between change in accessibility and population change is illustrated by growth patterns of nineteenth century New England. The advent of the railroad changed accessibility patterns in two ways. First, the railroad sharply raised accessibility of all points that it served relative to those which it did not serve. Second, it sharply reduced the accessibility advantage which ocean and canal served cities formerly enjoyed over landlocked ones, by providing a superior alternative means of transport. Towns which were inland and rail-connected would have experienced the greatest increase in accessibility. Towns which were seaports and were not connected to the railroad would have experienced the least change, with inland non-rail connected and coastal rail connected towns experiencing an intermediate degree of change.

Towns	Number	1850-1870 % change population	1850[1] average access
Inland rail connected	17	53.5	55.6
Inland without rail	16	30.6	35.2
Seaport rail connected	9	27.2	42.7
Seaport without rail	12	5.3	40.8
All rail connected	26	43.7	51.1
All without rail	28	18.5	37.7
All seaport	21	15.7	41.7
All inland	33	43.8	45.8
All towns	54	44.1	31.9

[1] Little relative change in accessibility between 1850 and 1870.

In this examination of fifty-four towns (between 1500 and 5000 population) within the study area, percentage change in population is clearly correlated with earlier change in accessibility, and is clearly not correlated with the static level of accessibility.

The same conclusion is reached by examination of large cities individually. Fitchburg had its accessibility nearly doubled by the Fitchburg Railroad, and although it was still a location of fairly low accessibility, it grew at a rate two and a half times that of the general area for about ten years. Plymouth, whose similar gain in *inland* access was more than offset by the decline of its advantage as a seaport, grew even more slowly than before, following the construction of the railroads. Boston, tremendously favored as the "hub" of the newly formed railroad network, had always been tremendously favored as a transport center and continued to grow at about the same rate in spite of system changes.

A lack of data on population change during the 1950's prevents testing the current relationship between accessibility change and population change, but an inference can be made from a study by Amos Hawley, who found growth rates greatest in those sectors of metropolitan areas having highways but lacking railroads, precisely the areas with the greatest relative increase in accessibility following the advent of the automobile. It appears equally true today as in 1840 that change in the accessibility of an area relative to the change in nearby areas is a prime factor in population growth patterns. To study accessibility at only one point in time or to study change in accessibility in a single area is likely to be meaningless.

Further Considerations

Additional observations about transportation impact can be made which are not clearly illustrated by model analysis. These are considerations of "break of bulk," minimum threshold of service, and "irrational" human reaction to transport system change.

Prior to completion of through rail transport to New York City, both goods and people traveling from Boston, Worcester, and points north normally moved by rail to Providence, Stonington, or Norwich, then transferred to ships for the remainder of the journey. This gave those ports advantages in the handling of goods, and as low-cost locations for processing. Since goods were unloaded and handled there anyhow, production at that point involved no additional terminal charges as there would have been at an intermediate location on either the ship or rail portions of the route. With completion of the rail connections to New York just prior to the Civil War, these points lost their special advantage, and their growth rates declined dramatically.

There is no equivalent "break of bulk" associated with a highway system because passengers and freight normally travel in the same vehicle from origin to destination. It seems that the expectation of major impact at route junctions is largely based on a mental "hangover" from the former condition where different modes joined; however, to that extent it is a delusion.

Gloucester in the 1800's provided an example of the effect of provision of a "minimum threshold of service." Gloucester had all the requisites for a thriving fishing business except quick access to a major market. This was ultimately provided by the railroad, and as a result Gloucester's trade and population grew out of all proportion to the change in accessibility. Overnight transport to Boston, which was a necessary minimum level of service for utilization of Gloucester's resources, had been provided.

Similar effects may be expected today for areas brought within overnight trucking or commuting distance of a major metropolis. Lowell now offers residents a reasonable commuting distance to Greater Boston jobs because of a new highway. Ski areas of southern New Hampshire are being aided by being brought within "day trip" distance of Boston. As a result of the New York Thruway, the middle Hudson Valley is now a suitable location for industries requiring "same day" deliveries to New York City.

Even in instances where rational analysis indicates that transportation impact should not be great, it seems that if there is a public expectation of impact, it may occur just because of such an expectation. Connection with the railroad was an event of great local importance in 1840, even when rationally unimportant. People expected great changes, hence the "business climate" was good. Money was invested in facilities in anticipation of growth. Real estate promoters in persuading people to locate in an area, ballyhooed the coming of the railroad. The combination of "climate" and promotion was probably enough to stimulate, at least for a while, investment and growth of some communities.

In the same way today, new expressways are eagerly awaited by numerous

chambers of commerce and real estate promoters, ready to arouse public enthusiasm that might lead to growth over and above that "rationally" expectable. This can be stretched too far, as evidenced by a number of still vacant though loudly promoted tracts at junctions of major highways in the Northeast. It seems that some such locations, even though well served with highways, cannot expect great growth.

In some instances, intercity highways will have effects not shown by any regional model because of intracity use. Within a city or a metropolitan area, some intercity highways act as urban arterials, resulting in the same expectation of impact as most urban expressways. In some less populated areas, the effect of an intercity highway may result in bringing a larger labor force within commuting distance of any point along the highway and therefore may be significant. Relief of congestion caused by through traffic is a substantial benefit to cities and towns that are bypassed by new expressways. This is evidenced by numerous studies.

General Applicability

These findings have been made for the Southeastern New England region, but they should be of general applicability. However, regional differences in highway patterns and dependence upon highway transportation will affect the magnitude of impact which can be expected.

Many areas of the West and Midwest are served by fewer highways farther apart than is the East, and traffic moves at speeds of sixty miles per hour and over. Accessibility patterns in such areas are probably more "distorted" along main highways than in the Northeast. However, these patterns also are less likely to be greatly changed by new construction which primarily will aid travel through urban areas, but will do relatively little to raise intercity speeds.

The degree of dependence by areas upon highways also varies. New England is poorly located in a corner of the nation. With its industrial competitors between it and the rest of the country, the industries which have prospered there have become "select," not being dependent on transportation. Extractive industries are of far less than average significance to New England, while manufacturing and service industries are of disproportionate importance. Distances between cities are relatively short. All this seems to suggest that transportation generally is of relatively low importance to the New England region, but its highways carry a larger proportion of traffic than in the "typical" area.

Technical changes in the near future seem unlikely to affect the impact of transportation. A dramatic lowering of costs through gas turbine, free piston engines or other motive development appears doubtful. The greatest technical change likely is an increase in the importance of "containerized" or "piggy-back" freight. [Ed. note. A water borne version, "fishy-back," covering east coastwise shipping has recently been developed out of New York] The ultimate effect of this change probably will mean more use of intercity roads for short hauls and less use for long hauls. However, even this effect will be slight. The long-term increase in intercity highway travel seems to be the most significant future trend likely to affect highway importance and impact.

In summary, the general findings of this study seem applicable to all areas of the United States for at least the next decade, but highway location will be of varying importance to land use in different regions, depending upon highway pattern and industrial composition.

Land Use Implications

The results of this study indicate that the location of intercity highways will not be of the same significance as the location of railroads in the 1840's. The differentials in transportation service created by highways are far smaller than those of the railroads in 1840. Much of the impact of the railroad was the result of an enormous overall reduction of transportation costs over a thirty-year period and the creation or removal of break-bulk points. However, neither of these effects can be expected with highway construction. Highway impact is less "channeled" than that of the railroad. Towns bypassed due to new construction are not faced with the transportation tragedy that such a deflection involved in the 1840's. As a result, at least outside metropolitan areas, exact alignment of highways is of much less significance to city growth than is general highway configuration. Therefore, it seems that intercity highway impact on land use is likely to be less locally pronounced than that of the railroad, but effective over a wider area.

The relative change in accessibility has been found to be the prime transportation influence on population growth. This means that new highways will have their greatest impact where they replace especially poor roads and in areas dominated by population centers connected by the highway. For this reason, the likelihood of causing major accessibility change for a city or a metropolitan area declines with increasing city size and nearness to other cities. While highways have their greatest local impact in large metropolitan areas, intermetropolitan highway configuration will have the least overall growth influence on them.

Intercity highway influence will depend also upon the type of existing highway configuration, regional dependence upon highway transportation, the public expectation of transport impact, and a variety of purely local factors.

Planning Implications

Yes or no answers to the planning questions originally asked in this study cannot be made. Making one city a junction of major intercity highways and bypassing another will certainly benefit the former, but in most cases the benefit will not be great.

A policy of aid to depressed areas could be implemented in part through the location and programming of highway construction, but except in rare cases this alone would be insufficient to produce a really significant change. Directing population growth to or away from huge metropolitan areas by highway location is even less likely to be successful because such areas are especially insensitive to intercity highway configuration.

Aid to depressed areas and direction of growth cannot reasonably be implemented at the same time through highway location. Fall River, New Bedford, Providence, Lowell, and Lawrence are depressed areas needing aid. According to these findings, the highway configuration which best aids them is not one linking them together but a system of radials from Boston. This, on the other hand, will also reinforce Boston's position of dominance. This is a story as old as transportation: each area in aiding itself through transportation improvement almost inevitably reinforces the major urban area of the region.

In all probability, the location of interstate highways will continue to be on the basis of "highest density of service" and their programming on the basis of highest cost/benefit ratio, both costs and benefits construed relatively narrowly. The burden is on the planner

to demonstrate that other considerations are of sufficient importance and predictable effect to change present methods of design. While the effects of highway location are to some extent both predictable and directable, highway location at the regional scale should not be considered a powerful tool for shaping the environment.

PLANI-TORIAL

(Continued from Page 2)

will be overlooked. Accordingly, we invite you to send no later than April 1, any ideas you may have conceived or developed in this field, or of which you are aware, to the Urban Land Institute, Suite 116, 1200 - 18th Street, N. W., Washington 6, D. C. Due credit will of course be given for any material incorporated into the study.

This is the first phase of what is hoped will develop into a broader and more detailed exploration of this important subject. The timing of this phase is designed to result in a report which will be available to you and interested groups and organizations by early fall of this year. Consequently, it is most important that we have your suggestions immediately.

THE J. C. NICHOLS AWARDS

(Continued from Page 2)

Re-Housing" by Hubert Kelley, University of Kansas City, 1952-1953; and "Mobility—A New Aspect of Community Life" by Richard B. Duke, Michigan State College, 1953-1954. (See July-August issues 1952 and 1953.)

Under the current form which is the grant-in-aid for graduate research study the Awards have been as follows: 1954-1955, University of California, "Transportation Influences in Urban Development" by Robert S. Nielsen; 1955-1956, Georgia Institute of Technology, "Relationships between Land Value and Land Use in a Central Business District" by Gerald K. Taylor, Jr. —published as a complete study; 1956-1957, Cornell University, "A Model Procedure for the Administration of Zoning Practices" by Robert M. Leary—published as a complete study; 1957-1958, University of Wisconsin, "Problems in the Urban Fringe of a Small Metropolitan District" by Robert L. Wall—as yet unpublished; 1958-1959, Massachusetts Institute of Technology, "The Regional Impact of Highways" by Philip B. Herr—here presented in briefed form; 1959-1960, University of North Carolina, "Cost of Government Services in a Downtown Area" by Raymond J. Green—currently under preparation.

The sponsoring university for the academic year 1960-1961 is University of Pennsylvania; and for 1961-1962, The Ohio State University.

EXCLUSION OF RESIDENCES FROM INDUSTRIAL DISTRICTS

In 1948, Urban Land Institute first presented its contention that the prohibition of residential development in industrial districts is a valid principle in zoning—see Technical Bulletin No. 10. The exclusion of new residences from manufacturing districts now appears in most zoning ordinances. The introduction of this provision has proceeded even though very few court cases have arisen to establish the police power to exclude residences from non-residential areas in zoning. Now there is a clear-cut court decision on the point. Moreover, the ruling goes even further and upholds the exclusion of residences in commercial districts.

In the case decided by the Illinois Supreme Court (*People ex rel. Skokie House Builders* v. *Village of Morton Grove*, 157 North Eastern (2d) 33 Supreme Court, March 20, 1959), a developer purchased a group of lots in a commercial district and planned to build a group of row houses on the tract. However, as reported in *The American City*, after the developer had made some progress with his plans the local zoning ordinance was amended to forbid new residential construction both in manufacturing and in commercial districts. The new provision was challenged both on a theory of vested rights and on the ground that the exclusion of "higher" residential use in less restrictive districts was void in itself.

In its opinion, the Illinois Court explicitly held that power to exclude residences from non-residential areas was found in the enabling act. It also upheld the general principle of non-cumulative zoning restrictions with "higher" uses excluded from later districts. However, in this case, the Court held that the developer has obtained a vested right to go ahead. The decision in part, follows:

"There are many arguments in favor of this type of ordinance, although such an ordinance is a radical departure from our thinking and opinions in the past. We note a few. The dangers of heavy traffic are greater in mixed residential-industrial or residential-commercial districts than in districts devoted to just one purpose. Industrial and commercial districts are not good places to bring up families from a health standpoint; and the presence of children in and about industrial and commercial districts leads to a demand for school, park and playground facilities in an area where there is either no land available or the land available is ill-suited to such uses. In short, whether industry and commerce are excluded from the residential areas, or residences from industrial and commercial areas, it is not unreasonable for a legislative body to assume that separation of the areas would tend in the long run to insure a better and more economical use of municipal services, such as schools, providing police protection, preventing and fighting fires, and better use of street facilities. The general welfare of the public may be enhanced if industry and commerce are provided with a favorable climate. The sale of a few lots at important points in a district may make industrial or commercial expansion impossible or prohibitively expensive. To protect the residents in the district, traffic may be slowed down unduly and thus detract from the efficiency of production and trade. In final analysis, it seems clear that industry and commerce are also necessary and desirable and that a proper environment for them will promote the general welfare of the public. We are of the opinion that the exclusion of residences from a commercial or industrial district is within the police power of the state."

ULI MEMBERSHIP

Membership is open to any individual, company, organization or public agency. ULI's objectives are to promote sound city growth, conservation of present commercial, industrial and residential areas, and the reconstruction of blighted areas.

Services and publications of the Institute are available as follows: $10 per year subscription for students and libraries; $25 membership for corporations, associations, public agencies, and their representatives; $100 Sustaining membership including affiliation with Community Builders' or Industrial Council.